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which they should not be pleased. Nor can they discriminate in the matter of poisonous herbs. In the northerly Sierras they perish yearly, cropping the azaleas; Julien lost three or four hundred when wild tobacco (*Nicotiana attenuata*) sprang up after a season of flood water below Coyote Holes; and in places about the high mountains there are certain isolated meadows wherein some herb unidentified by sheepmen works disaster to the ignorant or too confiding herder. Such places come to be known as poison meadows, and grasses ripen in them uncropped year after year.

What have the sheep come to know of man in their fifty centuries' association with him? Mrs. Austin answers:

It is doubtful if the herder is anything more to the flock than an incident of the range, except as a giver of salt, for the only cry they make to him is the salt cry. When the natural craving is at the point of urgency they circle about his camp or his cabin, leaving off feeding for that business; and nothing else offering, they will continue this headlong circling about a boulder or any object bulking large in their immediate neighborhood remotely resembling the appurtenances of man, as if they had learned nothing since they were free to find licks for themselves, except that salt comes by bestowal and in conjunction with the vaguely indeterminate lumps of matter that associate with man. As if in fifty centuries of man-herding they had made but one step out of the terrible isolation of brute species, an isolation impenetrable except by fear to every other brute, but now admitting the fact without knowledge, of the God of the Salt. Accustomed to receiving this miracle on open boulders, when the craving is strong upon them they seek such as these to run about, vociferating, as if they said, In such a place our God has been wont to bless us; come now let us greatly entreat Him. This one quavering bleat, unmistakable to the sheepman even at a distance, is the only new note in the sheep's vocabulary, and the only one which passes with intention from himself to man. As for the call of distress which a leader raised by hand may make to his master, it is not new, is not common to flock usage, and is swamped utterly in the obsession of the flock-mind.

Then there are the sheep dogs, those wolves that we have ameliorated to protect the sheep from other wolves. But our space prevents even a tasting of the interesting notes on dog ways that the book offers. Let us but just note the strong insistence of our author ob-

server that dogs are not bred sheep dogs, but trained to be sheep dogs. "What good breeding means in a young collie is not that he is fit to herd sheep, but that he is fit to be trained to it." Rather against the inheritance of acquirements, this.

There is much keen observation, much shrewd suggestion, and no end of delight in 'The Flock.' And trained in the scientific method or not, Mrs. Austin is honest and truthful as one may be. That is, she tells only what to her eye and ear and mind comes with the seeming of truth. No rigorous scientific pundit can do more. For truth is for any of us too often at the bottom of the well.

VERNON L. KELLOGG

STANFORD UNIVERSITY,
CALIFORNIA

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

THE 185th meeting of the society was held on January 9, 1907, with President Lindgren in the chair and fifty-four persons present.

Regular Program

The Paleozoic Section of the Upper Yukon, Alaska: ALFRED H. BROOKS and E. M. KINDLE.

This paper was presented by Mr. Brooks, who, in company with Mr. Kindle, devoted part of the field season of 1906 to a detailed study of the rocks exposed between the international boundary and Fort Yukon, along the banks of the Yukon and Porcupine Rivers.

The total thickness of Paleozoic strata, comprising this section, is estimated to exceed 15,000 feet, but as the bottom was not determined, it may be very much greater. *The lowest member* of the succession is a series of quartzites with intercalated limestones and shales, which is well developed on the Porcupine near the international boundary. Provisionally, at least, these rocks may be correlated with the more highly altered rocks called the Birch Creek schists which occur in large areas south of the Yukon. On the Porcupine these rocks are comparatively little altered and intrusives appear to be entirely absent, except for occasional small dikes, while

to the south the same series is much metamorphosed, sometimes to complete recrystallization, and intrusives are abundant. *The next member* is made up of limestone which on the Porcupine is about 600 feet thick and carries Ordovician fossils. This terrane comprises bluish-gray, non-magnesian limestones, distinguishable lithologically from the buff dolomitic series which follows them, but has not been definitely recognized in other parts of the province. The relation of these Ordovician beds to the older rocks is probably one of unconformity.

The Silurian is represented by at least 2,500 feet of magnesian limestone with some quartzites and slates, which are probably conformable to the Ordovician. Its correlation with the Fortymile series of Spurr is suggested but not proven. When *the Devonian* is considered, the problem becomes more complex, as no complete section of these rocks has yet been found. In general terms it can be said to be made up of shales, slates and cherts, with some limestones, while locally ancient lava flows and tuffs dominate over the sediments. On the Yukon the igneous rocks are very much more abundant than the sediments, while on the Porcupine the sediments are most abundant. The thickness is much in doubt, but can not be less than 3,000 feet and may be twice as great. The relation of the Devonian to the Silurian is unknown, but is probably one of unconformity. A black shale and slate bed some 1,300 feet thick constitutes the upper member of the Devonian and within this formation is probably the dividing line between the Devonian and the Carboniferous.

In this province the Carboniferous embraces about 4,000 feet of sediment, usually characterized by an absence of igneous rock. Overlying the shale mentioned above is about 1,000 feet of a thin-bedded limestone and shale series which carries Carboniferous fossils which have not yet been studied in detail. After these limestones and shales were laid down, the character of the sediments changes abruptly, indicating possibly a period of erosion. A heavy bed of chert conglomerate forms the basal member of the higher series and this is succeeded by shales, sandstones

and conglomerates with an aggregate thickness of 1,600 feet. A limestone bed some 200 feet thick constitutes the youngest member of the Carboniferous. This is overlaid in different parts of the province by younger terranes of various ages. On the Porcupine the lowest member of the Devonian is a limestone 300 feet thick, while olive and chocolate-colored shales, in part fossiliferous, appear to comprise a large share of the Middle Devonian sediments.

The Stratigraphic Succession in the Region Northeast of Cook Inlet, Alaska: SIDNEY PAIGE and ADOLF KNOPF.

IN this communication the combined results of the field studies of this region in 1906 were presented by Mr. Paige. The rocks exposed in this geologic section were found to range in character from garnetiferous mica schists of probable pre-Silurian age to unconsolidated Pleistocene stream and glacial gravels. Jurassic strata are very extensively developed and are divided into two unconformable formations, the lower of which consists chiefly of andesitic breccias and amygdaloids, 1,000 feet in thickness and overlain by graywackes, shales, sandstones and conglomerates. Marine shells, found both in the tuffs and in the graywackes, fix its age as Lower Middle Jurassic. The younger Jurassic rocks consist of shales, arkose, sandstones, conglomerates with some interstratified tuffs. The age indicated by fossil evidence ranges from the upper part of the Middle Jurassic through the Upper Jurassic. Conformably overlying these rocks is a Lower Cretaceous limestone 300 feet thick.

The Upper Eocene (Kenai) rocks of this section are freshwater sediments, consisting of shales, sandstones and conglomerates folded and carrying workable coal beds, of a maximum thickness of 17 feet. Their total thickness is not less than 3,000 feet; their age was determined on the fossil flora collected. Basaltic lavas and tuffs overlie the older rocks. They attain a thickness of 1,000 feet and form the summit topography of the region.

The Volcano Aso, in Kiushiu, Japan: ROBERT ANDERSON.

The volcano Aso-san is situated in the central part of the island Kiushiu in southern Japan. It has an active, modern crater a mile and a half in circumference which has been in eruption frequently during the past century, but its chief geological interest lies in the fact that it has an ancient crater ten or eleven by fourteen miles in diameter, larger than any other known crater. The crater basin, occupying an area of about one hundred square miles, is contained within sheer walls of andesite that rise on the average to a height of two thousand feet above the floor. A range of volcanic mountains, probably of subsequent origin, extends diametrically across the old crater and rises out of it over four thousand feet to a maximum altitude of five thousand six hundred feet above the sea. The vast crater of Aso-san is thought to have been formed either by the blowing off of the overlying mountain mass, or by the subsidence to a depth of three thousand feet or more of the oval region now occupied by the great bowl.

FRED E. WRIGHT,
Secretary

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 623d meeting was held on November 24, 1906, President Abbe in the chair.

Mr. Bigelow presented a request from a central committee in Geneva that this society approve and use in its publications the auxiliary language *Esperanto*.

Mr. Cyrus Adler presented a very interesting and felicitous memorial address on the late Professor Samuel P. Langley; his most notable services were, the establishment of uniform time, the study of the sun and its infra-red spectrum, and the researches in aerodynamics, which for the first time 'made the subject respectable.'

Mr. F. W. Clarke spoke on 'The Quadricentennial at Aberdeen,' at which he represented the Smithsonian Institution, describing briefly the magnificent new buildings and elaborate ceremonials.

Mr. E. Buckingham then discussed 'The

Thermodynamic Scale of Temperature.' Since temperatures are not quantities in the ordinary sense of the word and are not additive, a scale of temperatures is an arbitrary thing and scales founded on the properties of different materials will not agree. In attempting to reconcile the readings of different gas-thermometers and reduce them to a theoretical thermodynamic scale, reliance has been placed on the observations on the change in temperature of gases forced through a porous plug, and excessive extrapolation has been necessary. The speaker has attempted to coordinate the discordant results by applying the 'law of corresponding states' and finds the discrepancies are very much reduced.

THE 624th meeting was held on December 8, 1906, Vice-President Bauer in the chair.

The evening was devoted to the annual address of the president, Professor Cleveland Abbe. His subject was 'The Progress of Science as exemplified by Meteorology.' He gave a rapid sketch of the history of the science with references to the Americans who had contributed to its advancement, and in conclusion exhibited a number of lantern-views of a water-spout photographed by numerous observers last summer near Marthas Vineyard, Mass., and thoroughly studied by Professor Bigelow.

THE 625th meeting, the 36th annual meeting, was held on December 22, 1906.

The report of the secretaries showed a resident membership of 130; fifteen regular meetings have been held; Vol. XIV. of the *Bulletin* has been completed and distributed.

The treasurer's report showed a sound financial condition.

The following officers were elected for 1907:
President—John F. Hayford of the Coast and Geodetic Survey.

Vice-Presidents—L. A. Bauer, A. L. Day, E. B. Rosa, C. K. Wead.

Treasurer—B. R. Green.

Secretaries—G. K. Burgess, R. L. Faris.

General Committee—C. G. Abbot, C. Adler, L. J. Briggs, W. A. DeCaindry, W. S. Eichelberger, L. A. Fischer, R. A. Harris, J. Page, I. Winston.

CHARLES K. WEAD,
Secretary

THE NEW YORK ACADEMY OF SCIENCES
SECTION OF GEOLOGY AND MINERALOGY

At the meeting of December 10, 1906, the following papers were presented:

Present Structural Character and Probable Former Extent of the Palisade Trap:

ALEXIS A. JULIEN.

In the Palisades, the trap sheet along the lower Hudson River, the structures most generally known are the vertical or columnar and the coarsely bedded structure with foliation parallel to that of the whole stratum. Less familiar is a coarse concentric structure visible on horizontal surfaces. A thinly lamellar structure has also been brought out by natural etching on weathered vertical surfaces, which appears to represent a flow structure, or, perhaps more properly, a pressure lamination.

At a certain zone along the face of the escarpment an interrupted or continuous sheet of decayed rock crops out, a principal cause of destruction of the columns by undermining. It indicates a process of preglacial decay of extreme antiquity, and is attributed to a balance of conditions of perpetual moisture in a coarsely granulated band of the trap. Two systems of faults traverse the trap sheet from north, or a little east of north, to the opposite point, and from north-northwest to south-southeast. Eight or nine faults have been located by previous observers, and some of these extend for several miles. But there is abundant evidence of a large number of other faults, those of one system marked by depressions which furrow the top of the ridge in the direction of its trend; those of the other system indicated by nicks or clefts (cloves) along the edge of the escarpment. The original thickness of the trap sheet shows that these hollows represent the bottoms of ancient gorges of a drainage system guided by the faults over the summit of the ridge. This signifies an enormous amount of denudation, doubtless effected by the continental glacier, which, in connection with the faults, has also resulted in the southwestward slope of the ridge down to the sea-level. As to the mooted question of the eastward extension of this sheet of the Newark formation

beyond the Hudson River, direct evidence appears in the low rock terraces between Dobb's Ferry and Peekskill, formerly occupied by the overlap of this formation; in the common distribution of zeolites, etc., in cracks of the gneisses on the east side of the river, which could only have been derived through infiltration of thermal waters from an overlying trap sheet; and in the correlation of depressions on opposite sides of the river, which have been impressed by an ancient drainage system over the uplifted Mesozoic terrane and across the present line of the Hudson River.

Development of the Inner Wall in Paleozoic Corals: G. E. ANDERSON.

From serial sections of *Craspedophyllum subcaespitosum* it was shown that the primitive union of septa is retained even after radial condition of septa is reached. The wall is formed by the turned-over and fused ends of the septa and at one stage resembles the fossular wall of certain corals. Final closure of the wall by bridging of the fossular gap occurs in accelerated mutations of this type and is normal in *Eridophyllum*. No true inner wall exists in *Acerularia* and similar genera.

The Geographical Classification of Marine Life Districts: A. W. GRABAU.

After a discussion of principles the following tentative classification was outlined:

GEOGRAPHIC DIVISIONS	BATHYMETRIC LIFE DISTRICTS PRESENT
I. Intercontinental seas or oceans.	{ Littoral, pelagic, abyssopelagic, abyssal.
II. Intracontinental seas.	
a. Mediterranean.	{ Littoral, pelagic, abyssopelagic, abyssal.
b. Epicontinental seas.	{ Littoral, pelagic.
III. Continental lakes.	{ Littoral, pelagic, more rarely abyssal.

The speaker advocated that the term littoral be extended so as to cover all that district from high water to the edge of the continental shelf (or beyond, to the point where the photic or lighted portion of the sea bottom ends), instead of restricting it to the shore zone, as is often done. He also advocated the restriction of the term epicontinental sea to that type of intracontinental sea which has no abyssal district. The advantage in pre-

cision thus gained and the natural character of the classification proposed were pointed out.

A. W. GRABAU,
Secretary of Section

THE AMERICAN CHEMICAL SOCIETY. NEW YORK
SECTION

THE third regular meeting of the season of 1906-7 was held at the Chemists' Club, 108 W. 55th Street, on January 11.

The Nichols medal, awarded annually for the best paper read before the New York Section, was presented to Howard B. Bishop for his paper 'On the Estimation of Minute Quantities of Arsenic.' Favorable mention was made of the paper of E. H. Miller and J. F. Thompson on the 'Silver Platinum Alloys' and of the papers of F. B. Power and Frank Tutin on the 'Chemical Examination of *Æthusa Cynapium*' and on the 'Chemical and Physiological Examination of *Chaillitia Toxicaria*.'

The rest of the evening was devoted to a symposium on the pure-food law by Messrs. H. W. Wiley (address read by chairman), Virgil Coblentz, R. Z. Doolittle and M. D. Foster. Further discussion followed, in which Messrs. Wm. J. Schieffelin, Albert Plaut, J. B. F. Herreshoff and L. L. Watters took part.

C. M. JOYCE,
Secretary

DISCUSSION AND CORRESPONDENCE

FACTS AND INTERPRETATIONS IN THE MUTATION THEORY

THE foremost champion of de Vries's mutation theory in this country undoubtedly is Dr. D. T. MacDougal, and he has largely contributed to the popularity of this theory. In a recent article¹ he takes up certain objections made by various writers, and attempts to show that they are without foundations or opposed to the known facts. But the criticism of the objections made by C. H. Merriam, D. S. Jordan and the present writer fails to convince, and only serves to demonstrate that the vital points have been misunderstood.

¹ 'Discontinuous Variation in Pedigree-Culture,' *Pop. Sci. Monthly*, 69, Sept., 1906, pp. 207-225.

Before I try again to give a review of my objections to de Vries's theory, I shall prove in detail that MacDougal's criticism of them, as well as of those of Merriam and Jordan, is unsatisfactory. It may appear as presumptuous, when I take it upon me to talk in behalf of the latter two gentlemen, who are well able to take care of themselves,² but I may be excused on the ground that I hold precisely the same views, and am thus defending my own opinions.

I. MacDougal first takes up Merriam's contention, that the study of geographical distribution of animals shows no evidence of 'mutation' (in the sense of saltation or discontinuous variation), since there are gradual transitions, which point to a progressive development of minute variations. This is not admitted by MacDougal, because he maintains (p. 209) that 'once a mutant has appeared, no evidence of its distribution can be taken to account conclusively for its origin.' Jordan has answered this in the article just referred to. But there is yet another aspect. Merriam did not express any view as to the *origin of mutation (saltation)*; he only wanted to bring out the fact that mutations, in the sense of discontinuous variations, seem to be extremely rare in nature, which is indicated by the fact that, morphologically, varieties and even species are often very close to each other, and that, if there are cases where a discontinuity is apparent, a closer investigation of the distribution, not only of the supposed mutant, as MacDougal puts it, but of the mutant and its allied forms, reveals the existence of intermediate forms.

With reference to this latter case, I should like to make a few additional remarks. Granted the existence of a connecting form between two extremes, which appear to fulfill the morphological requirements of mutation,³

² See Jordan's rejoinder in *SCIENCE*, September 28, 1906, p. 399.

³ We always are to remember that, strictly speaking, there is no morphological difference between fluctuating variation and mutation; the latter can only be recognized by experiment, according to de Vries, and also MacDougal. Thus it is not correct to talk, as MacDougal does, of